

Multimedia Technologies and Virtual Organizing of Learning

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This paper addresses the issue of what are the efficient uses of multimedia technologies in teaching processes, and what are the conditions that require these technologies in online learning. The background of this paper is made by exploring online master programs, given the burgeoning interest of this emerging phenomenon of the future of distance learning. Rigorous analysis and careful measurement of communication required were covered by empirical data. This analysis is to provide an early window into several communications processes and tasks that occur in virtual context of learning, using multimedia technologies.

Keywords: multimedia technologies, virtual organization, online learning, communication, effectiveness of learning

1 Introduction

The wake of information technology age has made market participants to have a hard time understanding how people can be competitive as long as multiple tasks have embraced their jobs, money coming along with the speed of accomplishment of their assignments. Multimedia technologies and rapid and intense developments in information technology are appropriate to help remedy this situation. Members of Cognitive and Technology Group of Vanderbilt have defined multimedia as “linkage of text, sound, video, graphics, and the computer in such a way that the user’s access to these media becomes nonlinear and virtually instantaneous” [12]. Due to technical progress and lowering prices, multimedia availability has increased significantly over last years. The Internet bubble which crumbled the markets in 2000 was in fact an opportunity for great buyers of IT infrastructure. Prices of optical fiber have lowered, and personal computers, even laptops, and internet access have become suddenly affordable for most people from middle class. A greater competition made personal computers currently on the market to be multimedia-capable, along with the use of Internet filled with web pages that contains graphics, animations, sound and video [3].

This paper examines whether or not a rich representation, such as multimedia, when used as a means to convey information, can better support the informational needs of market participants compared to a less rich representation such as written text and other classical means and conditions of communications.

This paper is organized as follows: a theoretical framework that describes the conditions under which multimedia technologies can provide solutions for virtual organizing of learning. Despite its diffuse nature, a virtual organization could exist if a common identity holds the organization together in the minds of members, customers or other constituents [7]. The third section describes the research method. In the fourth section there are statistical indicators and results. The findings are then analyzed. The paper concludes with a discussion of the implications of the findings.

2 Multimedia technologies: hardware, software, applications

This section is to provide an overview over multimedia technologies technical limits and opportunities. The central theme of the section is to examine the meaning of multimedia concept, focusing on levels and architecture of LAN, and programs. A special analysis is dedicated to multimedia application and the most widely known fields

where multimedia technologies are explored. It also addresses the issue of what is the wise use of multimedia technologies between their hardware and software requirements.

2.1 Hardware and Connections

Multimedia systems architecture is a combine use of different devices for:

- Acquisition (video cameras, video recorders, microphones, mouse and keyboards, sensors, digitization and virtual reality equipment)
- Storage of information (hard-disk, CD/DVD-ROM, Jaz/Zip drives, stick)
- Connections to an information technology network (Ethernet, Token Ring, FDDI, ATM, Intranet, Internet)
- Calculus systems (Multimedia Desktop, Workstations, hardware MPEG/VIDEO/DSP)
- In/out connections (CD-quality headphones, HDTV, SVGA, monitor, printers and faxes)
- Software (informatics programs for graphic editor of images, movies, sounds, presentations) [13].

These devices convey the information from its spoken and written forms into a virtual world based on integrated IT systems. For market participants who only use these devices in order to achieve different goals, the most important are that devices users explore for connection to the information technology networks [6] [8] [10]. The evolution of networks was as follows: LAN-Local Area Networks, MAN-Metropolitan Area Networks, WAN-Wide Area Networks, GAN-Global Area Networks.

Computers are made with different architectures which have created in time different levels for LAN:

- Low, figure 1. The network is structured around a mainframe which is connected with different users as terminals with limited functions. These types of LAN are most common for simple tasks as sending data to printers or e-mail.

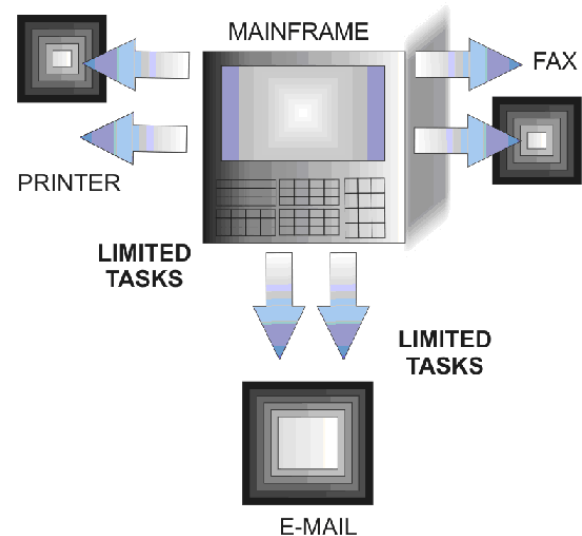


Fig. 1. Low level LAN

- Medium (peer-to-peer architecture), figure 2. The use of these types of LAN will reflect direct connections between users which explore multiple opportunities: files transfer, data base access from long distance, transaction processing. There are some limitations, especially related on connectivity. In order to remedy this it is recommended the use of peer-to-peer architecture only for small networks.

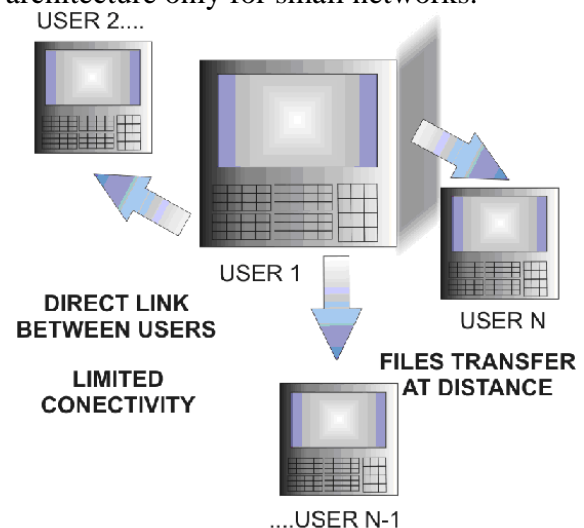


Fig. 2. Peer-to-peer architecture

- High (client-server architecture), figure 3. Clients are requesting information from different servers of LAN, where software applications are stored, through a Network Operating System, while servers execute tasks in the name of their clients. The network has a file server (back-end) which

provides a multitasking operating system for data base administrator, and a station called server for data editing and validation [13] [14] [17].

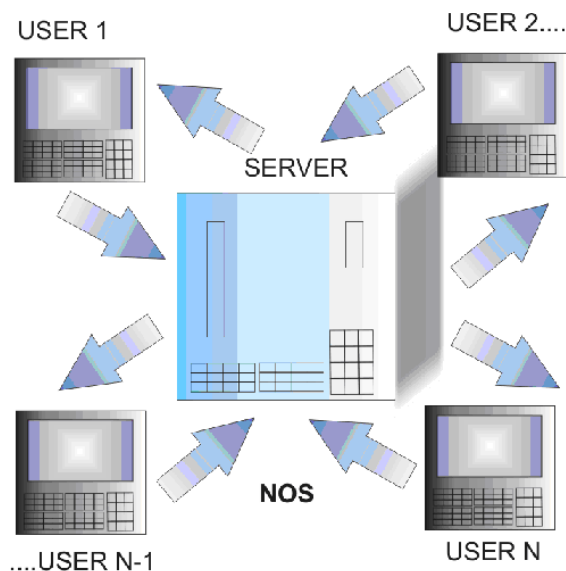


Fig. 3. Client-server architecture

Virtual organizing of learning depends on multimedia technologies. To be successful in applying tasks in a virtual organization there is always necessary to have good computer network, using different technologies: Ethernet, Token-Bus, Token-Ring. The most widely known and used accessories for network connections are: network boards, transceivers, modems, hubs, shares.

Along with storage and connecting devices there are a lot of them for display the data used, such as monitors, printers, plotters, headphones and alike.

2.2 Software for Multimedia

Although multimedia technologies users create and acquire solutions, they are seldom successful in applying that knowledge to their own activities without a little help. It is an indirect help because it is not implying people, but the user-friendly configuration of the software for multimedia. Most applications are presented with good graphic components, because the final users of the applications are not necessarily IT specialists, but simply ordinary average consumers of a product, not knowing how it's made. And this is not important for the

most people. All that matters is the reliability of an application along with the ergonomics faced by final users. This is why multimedia technologies require for this matter Graphical User Interface [13]. Even we are talking about a text editor, or a graphic design program, movie maker or sound recording, data base or learning, everything implies letters, tables, symbols and drawings, trend graphics, all consider as business graphics [5] [13]. Most common known multimedia software applications are for:

- Paint programs. Enable users to create and modify drawings: Paint, PaintBrush.
- Draw programs. Are exploring advanced functions of drawing, using images presented in vector form: CorelDraw, PhotoShop, PaintShopPro, CorelPhotoPaint.
- Worksheets. These are graphic programs for data tables and there are commonly used in finance and accounting. Data are inserted in cells linked to other cells and so on, presented in a friendly and attracted way as simple tables: Microsoft Excel, Microsoft Access, Lotus, Fox Pro.
- Slide show. Commonly known for their utility in presentations, these are programs which enable creation of diagrams graphics for reports and presentations: Microsoft Power Point.
- Animation and movies. These are applications which offer facility in movie editing, selecting, cutting, copying, mixing frames for great visual effects: Macromedia, Microsoft Gif Animator.
- Design. Architects and engineers' projects are impossible to be sustained nowadays without CAD programs assisted by computer. It is about 2D and 3D drawing, symbol editing, resizing, filling shapes and so on: Autocad.
- Desktop publishing. This is about function collections for text processing as graphic editors. By controlling text and image settings, final users of these applications are able to create magazines, newspapers, advertising, and books. The text editor is working after What You See Is What You Get principle, decreasing

pressure over the users and making the work comfortable: Microsoft Word.

- Internet. These are programs for web navigation, HTML editing and e-mail: Microsoft Internet Explorer, Netscape Communicator, Outlook Express, Eudora, Mozilla Firefox.
- Programming languages. These applications enable creation of programs for computers whether these are offline or on Internet online, using applets which permit integration of audio/video files in a web page: C++, Java [2] [13] [14] [17].

2.3 Multimedia Applications

This study is further extended by incorporating multimedia applications and the fields where these seems indispensable nowadays. It is considered there are six major fields of interest where multimedia applications make things easier: office, video production and editing, music, learning (especially distance learning), advertising and communication [13]. Distance learning and communication are, of course, highly coupled. Multimedia communications are especially of growing interest for distance learning because there is information as audio/video digital signals to send in a great amount of data, particularly as users are more geographically distributed. At least two aspects of availability are of interest, given multiple media alternatives for communication: the impacts of new electronic media on people's availability to communicate with one another, and the influence of a specific level of availability on a sender's media choice [7]. The need to ensure communication requests the rise in performance of data transmission speed. There are different types of multimedia applications, and several criteria for labeling them:

- From the point of view of the users' nature, there are interpersonal applications and personal applications. In the first case data transfers are made between two or more users, in the second, the connection has a user at one end, and a computer to the another one.

- From the point of view of the number of users, there are individual applications and group applications. An individual application is a simple connection between two users or between a user and a computer, meaning that no one else is receiving information from these connections. A group application means that many other users can log to the primary connections and receive or send information along with the two users or the user and the computer.
- Perhaps the more important classification of multimedia application is after time relation between applications steps. There are timing applications, when presentation of data is synchronized with their transmission, and non-timing applications, when presentation of data is next to the transmission. The users could choose which will be the moment of presentation.
- From the point of view of goals, multimedia applications are professional, for advertising or for transactions [11] [15] [16].

3 Open-Source Software for Collaborative Learning

This section focuses on virtual organizations and platforms for virtual learning using as case study a master degree program in its four years evolution. The section concludes that multimedia technologies and virtual learning are highly coupled and there might be a modern alternative to the blackboard and chalk. The case study presents the management of a course using multimedia technologies for online classroom applications, efficiency and security.

3.1 Communications in Virtual Organizations

A virtual organization is "a collection of geographically distributed, functionally and/or culturally diverse entities that are linked by electronic forms of communication and rely on lateral, dynamic relationships for coordination" [7]. A virtual organization could be seen from market participants as an

economic institution with external ties managed by employees organized in teams, assembled or disassembled according to what customers are requesting for [1] [7] [4] [9]. The social and economic advantages from an organization without frontiers could not be explored as the main goal of this paper, but how this openness could open a window in the modern learning management. First of all it is a problem of reconfiguring the boundaries between students' expectations and employment. Traditional teaching style with blackboard and chalk is replaced with non-timing communication, which allows students to learn and to work (figure 4).

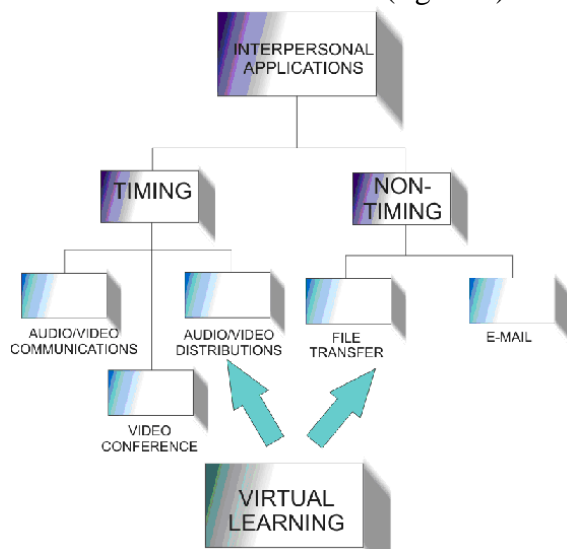


Fig. 4. Virtual learning components

A. Mowshowitz has pointed out that virtual organizations have a particular freedom. Called *combinatorial freedom*, this freedom which organizations enjoy, represents the ability to allocate work, information and other resources across people and subgroups depending on market demands [2] [14]. From an aprioristic point of view, the entities composing the organization may participate in several other virtual organizations simultaneously. For an example we can consider a professor who teaches different courses, at different master degree programs through an e-learning platform which both programs use.

To summarize, the attributes of virtual learning are the following ones:

- geographically distributed

- electronically linked
- functionally or culturally diverse
- lateral (versus hierarchically) connected [1].

Communication is fundamental for any form of organization and for every kind of relationship organizations are leading to, but it is preeminent in virtual organizations.

3.2 Volume and Efficiency

As its authors themselves use to say about it, MOODLE, acronym for Modular Object-Oriented Dynamic Learning Environment, is a "software package for producing internet-based courses and web sites. It is a global development project designed to support a social constructionist framework education" [18]. Open-source doesn't mean that MOODLE is a gift, being under GNU Public License. The GNU General Public License is a free, copy left license for software and other kinds of works. It might be said that MOODLE is copyrighted, even its users enjoy additional freedoms. Users are allowed to copy and to use MOODLE as long as they agree to:

- Provide the source to others
- Not modify or remove the original license and copyrights
- Apply the same license to any derivative work.

MOODLE was primarily developed in Linux using Apache, MySQL and PHP and has been tested with different operating systems such as Windows XP/2000/2003, Solaris 10, Mac OS X and Netware 6. Using and installing MOODLE imply some requirements [19]:

- Hardware: Free space available on disk must be 160MB, at least. Teaching materials need to be stored, and that is why 160MB won't be always enough. It is highly recommended more than 160MB free. Memory must have 256MB, at least, but it is recommended to have 1GB. The general rule is that 50 concurrent users can be supported by MOODLE for every 1GB of RAM. Virtual learning with hundreds or thousands of students requires more than 1GB, even probably not everyone enters at the same

moment on the platform. It depends, anyway, on users' specific hardware and software combination. In other words the capacity can limit the number of users your MOODLE site can handle. In these terms, the next numbers must be taken into account: browsing users and concurrent database users. Browsing users represent the maximum numbers of users able to browse the MOODLE site. In fact, this is the number of computers from a course. Concurrent database users are the number of users which use MOODLE in the same time. Using a timetable to obtain a big picture over a period of time and avoid congestion, might be a solution.

- **Software:** web server software is important. Most sites use apache as the web server software. If the server supports PHP, MOODLE will work fine. PHP scripting language is the other important software requirement. The two PHP versions, PHP4

and PHP5 must be use according to MOODLE version [20] [22].

The number of users depends at last on the hardware/software/network combination. Usually most important feature is the amount of RAM installed, but a deciding factor could be the speed processor, for reducing waiting times for pages to load. The general rule for a single server is that approx maximum concurrent users = RAM (GB)*50 and the approx maximum concurrent users*5. For example, a university with 1000 total computers on campus and 200 concurrent users at any time will need approx 4GB of RAM on the server to support the number of concurrent users [21] [22].

3.3 Multimedia technologies and effectiveness of learning – A case study: Using MOODLE for virtual learning in master degree program Communication and Public Relation in Business



Fig. 5. Master degree program home page

As previously presented, it is important that multimedia applications to have a friendly-user configuration. The Internet home page of the master degree program, covered by MOODLE has three sections: a central main section for courses and two secondary administrative sections.

Main section: is also named **Course categories**. Being as much important as courses themselves, the first course category is not a course, but a **digital notice board**, the only administrative section from the main section which is available for users, others

than the administrator user. After the digital notice board there is a dissertation thesis section. Finally, after these major categories, come the proper courses, grouped by each semester. The digital notice board is the main communication channel between the board of the master degree program, professors and students. In this course category students are informed about final evaluation, projects and session exams, registration files, scholarships and fees. Last minute notices are also to be found here, the digital notice board being for students just like the Code of Laws for a

citizen. As long as information is posted here, no one could say that she or he didn't know about it. After each course categories, at the end of a row, it might be seen a number which indicates how many subcategories has a course.

Left section: it is the main administrator user's zone. Its subcategories are:

Configuration: Configure variables that affect general operation of the site; define how the front page of the site looks; choose how the site looks (colors, fonts etc); checking and editing the current language pack; manage installed modules and their settings; manage installed blocks and their settings; choose text filters and related settings; configure automated backups and their schedule; define basic settings for HTML editor.

One of the most important functions is **Administration**. It provides a big picture over the setting architecture of the site. The admin users can virtually do anything on configurations, users, courses:

- **Users:** Authentication, edit users' accounts, add new users, import new user accounts from a text file, choose internal or external ways to control enrolments, enroll students, assign teachers.
- **Backup and restore:** Creates backups on server for: assignments, chats, choices, forums, glossaries, journals, labels, lessons, quizzes, resources, surveys, workshops.
- **Courses:** this subsection is coupled with the main section of the sight, where courses are. The admin user can add or delete courses, limit access to them, hide them for other users, or edit them.
- **Logs:** admin user can choose what log wants to see.
- **Site files:** It put together all files created by the admin user.

Under administration section there is a field, **online users**, where any user can see the users online in that moment and the users on line in past five minutes. Even the communication on platform is non-timing, it is good for learning process that students

know that they are online in the same time with their professors.

The **left section** ends with **My courses**, where every user, student or professor, can have an overview of the courses they signed up at.

Right section has one of the most important functions from the home page,

Turn editing on button, which allow admin user to change the site configuration. There is also a monthly calendar where students can find important notices about their assignments, exams etc. And there is more:

- **Upcoming events:** coupled with monthly calendar, offer details about the major assignments students must achieve.
- **Recent activity:** offers additional information about professors' recent activity, especially feed-backs for students' assignments, but also counts the students' interventions on their assignments.
- **Latest news:** This is a **digital notice board abstract**, where admin user, at professors' or board's request, post vital information students must see before the regular digital notice board. It is very useful for emergency situations like changing the room for an exam in the last minute.
- **Search:** It provides a search engine for the site.

3.4 Virtual courses and assignments for students

The entire learning activities carry on exclusively online, except the exams. Professors can have an extremely sharp evidence of their students' learning activities. They are practically admin users for their courses, but only for them. They can add a resource as following:

- compose a text page
- compose a web page
- link to a file or a web site
- display a directory
- insert a label

The admin user controls very carefully the access to courses, in order to avoid accidental switches between professors and others'

courses. The major teaching assignments for students are adding an activity as: assignments/homework, forum, glossary, lesson, quiz and survey.

Every student's assignments are registered after date, time, file size, file format.

3.5 Security of Virtual Learning

The platform is a great solution for learning management, not only through simple and friendly-user solutions, but for security matters as well. Security is a double issue: against unregistered users from outside, and security for students' identity.

First of all the admin user uses his options from Configuration section and establishes a keyword which allows students to register. The keyword is sent to every student by e-mail. This keyword will then be required for every course, but only once. Every student registers a personal account with a user name and a personal password, not even the admin user knowing what it might be. However, the admin user can enter a new password for a user, in case that he or she forgets the password. After a student creates the account and registers to every course, the courses will be displayed in **Left section**, in **My courses**. Then there is the problems of identity, as long as the students enter the platform from home, from their offices or everywhere else, not being face to face with the professor. It is not very difficult for a student to ask somebody else to make his homework. All he has to do is to give the password of his account to his friend. Indeed, but there are some issues that make this thing very difficult:

- all the exams are with presence in front of a professor, along with an identity document ; so, the friend could not come, and making the homework without exam will be useless; it is better for the student to make the homework by himself, because he has to study, anyway.
- there is an activity report which provide a great overview over the entire activity of a student. This report could provide strategic information about: online,

complete activity, logs on a day and all logs.

The most important security issue is the ID code of the main board of the personal computer.

So, if one student allows another student to use his account and response to his assignments, the admin user will know. It is not unusually for a student to log on the platform from different stations, but it is strange for two different accounts to have the same ID for main board, except the case when students are from the same family.

All the assignments are sent as files in most well known format, as doc, pdf, xls. It is very easy to check the document properties, or the passages from these documents, to discover if something is wrong.

4 Conclusions

This study shows the social and behavioral implications of virtual organizing of teaching, through multimedia technologies. At certain levels, virtual form of organizations brings good changes and opportunities for:

- highly dynamic processes
- contractual relationships
- edgeless, permeable boundaries
- reconfigurable structures [7]

An encouraging result is the demonstrated capability of electronic communication to support **lateral communication**, **"combinatorial freedom"** and **broad participation** across social groups, just as students are. Virtual organizing of learning assumes that information flow **less** through **hierarchy** and **more** through **transactional exchange** and network relationships. Versus face-to-face groups, where high-status members could dominate the others, the virtual organization provides some **greater equality of participation**, which is recommended in teaching activity. **Transactional cost of learning** process are strongly lowered, because non-timing communication allow students and professors to work off line. There is no need of classrooms, along with the bills of their maintenance, and no transports will be made

at all, except for the exams. All that users have to do is to take care of their Internet connection.

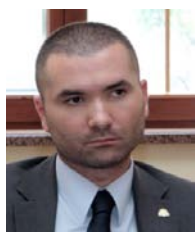
The use of multimedia technologies for virtual learning, such MOODLE is, provides a lens for understanding teaching process as an modern alternative to blackboard and chalk, providing the insights and profound development of future of learning.

This burgeoning area of learning still needs extensive theoretical development, conceptual explications, philosophical analyses, empirical research and substantive criticism.

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